

## **REMARKS**

### **A. Status of Claims and Amendments**

Favorable reconsideration of this application as presently amended is respectfully requested. Claims 1, 3-5, 7, 12, 14-16, 18-20, 22-26, 28-34, and 36-42 are pending. Claims 2, 6, 8, 17, 21, 27, and 35 have been canceled. Claims 9-11, 13, 19, 20, 22-26, 28-34, and 36-39 have been withdrawn as being drawn to non-elected species.

Claim 1 has been amended to recite a bonding method for bonding objects **comprising Si, SiO<sub>2</sub> or glass** to be bonded together in a solid phase at 500°C or less after subjecting bonding surfaces of the objects to be bonded to a hydrophilic treatment using a plasma. Claim 1 has also been amended to recite that, after the surface activation step, the step of heating both said objects while the surfaces of both said objects are in contact, thereby bonding both said objects to be bonded together **through covalent bonds between bonding surfaces of both said objects comprising Si, SiO<sub>2</sub> or glass**. Support for these amendments to Claim 1 may be found, for example, in originally filed Claim 17 (now cancelled), as well as in pages 43 and 44 of the present application.

New Claims 40-42 have been added. Support for these new Claims may be found, for example, in pages 43 and 44 of the present application.

### **B. Procedural Matters**

Applicant acknowledges, with thanks, the Examiner's acceptance of the Request for Examination filed November 4, 2008.

Applicant also acknowledges, with thanks, the Examiner's acceptance of the drawings filed June 2, 2006.

Applicant further acknowledges, with thanks, the Examiner's acknowledgement of the claim of priority under 35 U.S.C. § 119(a)-(d) or (f), including the acceptance of certified copies of the priority documents received from the International Bureau.

C. **Examiner Interview**

Applicants wish to thank Examiner Goff for the courtesies extended to Applicants' representative during an Examiner Interview on April 6, 2009 (Examiner Interview). During the Examiner Interview, Applicant's representative discussed why the claimed invention is patentable over U.S. Pat. No. 5,421,953 to Nagakubo *et al.* (hereinafter "**Nagakubo**") and U.S. Pat. No. 5,383,933 to Katada *et al.* (hereinafter "**Katada**"), either taken alone or in combination, for the reasons discussed in more detail below. Applicant's representative also discussed why the combination of **Katada** with **Nagakubo** does not teach or suggest the claimed invention for the reasons discussed in more detail below. Applicant's representative also discussed the fact that the sixth embodiment of **Nagakubo** does not describe heating at 500°C or less to form **covalent bonds**.<sup>1</sup>

D. **Response to Rejection of Claims 1, 3-5, 7, 12 and 14-18 under 35 U.S.C. § 112, First Paragraph, as Failing to Comply with the "Written Description" Requirement**

At Sections 3-4 of the present Office Action, Claims 1, 3-5, 7, 12, 14-16 and 18 have been rejected under 35 U.S.C. § 112, first paragraph, as failing to comply with the "written description" requirement.<sup>2</sup> This rejection is respectfully traversed with respect to these Claims, as amended or as currently presented.

In support of this rejection under 35 U.S.C. § 112, first paragraph, the present Office Action makes the following allegation:

***Allegation 1:*** Claim 1 as amended requires "thereby covalently bonding both said objects to be bonded to together". Applicants specification does not disclose covalently bonding both of the objects. Support for covalently bonding silicon substrates is found on page 43 in forming a Si-O-Si bond. However, there is no support in the specification for broadly claiming a covalent bond between any two objects.<sup>3</sup>

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<sup>1</sup> See **Nagakubo**, column 10, line 62 to column 11, lines 5-7.

<sup>2</sup> See present Office Action, pp. 2-3.

<sup>3</sup> See present Office Action, p. 2.

Responsive to Allegation 1, Claim 1 has been amended to recite that that, after the surface activation step, the step of heating both said objects while the surfaces of both said objects are in contact, thereby bonding both said objects to be bonded together **through covalent bonds between bonding surfaces of both said objects comprising Si, SiO<sub>2</sub> or glass**. The underlined language is supported at page 43, as well as page 44, of the present application. In view of these amendments to Claim 1, the rejection under 35 U.S.C. § 112, first paragraph, of Claim 1, as well as Claims 3-5, 7, 12, 14-16 and 18<sup>4</sup> which ultimately depend from amended Claim 1, as failing to comply with the “written description” requirement has been overcome, and should therefore be withdrawn.

**E. Response to Rejection of Claims 1, 3-5, 7, 12 and 16-18 under 35 U.S.C. § 103(a) as being Unpatentable over Nagakubo, in View of Goel, and Optionally Katada, and/or Xu or Vasudev**

**1. Rejection of Claims 1, 3-5, 7, 12 and 16-18 under 35 U.S.C. § 103(a) as Being Unpatentable over Nagakubo, in view of Goel, and optionally Katada, and/or Xu or Vasudev**

At pages 3-7 of the present Office Action, Claims 1, 3-5, 7, 12 and 16-18 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Nagakubo in view of U.S. Pat. No. 6,486,597 to Goel (hereinafter “Goel”), and optionally Katada, and/or U.S. Pat. No. 6,749,729 to Xu *et al.* (hereinafter “Xu”) or U.S. Pat. No. 5,418,095 to Vasudev *et al.* (hereinafter “Vasudev”).<sup>5</sup> This rejection has been rendered moot with respect to Claim 17 by the cancellation of this claim. This rejection is also respectfully traversed with respect to Claims 1, 3-5, 7, 12, 16 and 18, as amended or as currently presented, for at least the following reasons.

**2. Nagakubo Does Not Teach or Suggest All of the Feature of Claims 1, 3-5, 7, 12, 16 and 18**

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<sup>4</sup> Claim 17 which was also rejected under 35 U.S.C. § 112, first paragraph, has been cancelled.

<sup>5</sup> See present Office Action, pp. 3-7.

As currently amended, Claims 1, 3-5, 7, 12, 16 and 18, include the feature of attaching OH groups to the surfaces of objects to be bonded and then heating the objects at a temperature of 500°C or less to bond together the surfaces of the objects using covalent bonds, wherein the surfaces comprise Si, SiO<sub>2</sub> or glass.<sup>6</sup> In contrast, Nagakubo does not teach or suggest forming covalent bonds at a temperature of 500°C or less.

3. **Nagakubo Does Not Teach or Suggest the Optimized Surface Activation Treatment of the Claimed Invention**

In addition, the inventor of the claimed invention have optimized a method (process) of a surface activation treatment, thereby efficiently making OH groups adhere to the surfaces of objects to be bonded. Because the OH groups are efficiently adhered to the bonding surfaces by the present invention, the surfaces may be covalently bonded together under the conditions recited in Claims 1, 3-5, 7, 12, 16 and 18. By contrast, **Nagakubo** does not teach or suggest a process that efficiently adheres OH groups to a bonding surface that allows for covalent bonding under the conditions of the claimed invention.

4. **Nagakubo Does Not Teach or Suggest Claimed Feature of Bonding Together Surfaces of Si, SiO<sub>2</sub> or Glass Using Covalent Bonding at a Temperature of 500°C or less**

In rejecting Claims 1, 3-5, 7, 12 and 16-18 over **Nagakubo**, in view of **Goel**, and optionally **Katada** and/or **Xu**, or **Vasudev**, the present Office Action relies upon following allegation:

***Allegation 2:*** As to the limitations of “bonded together in a solid phase at 500°C or less” and “after the surface activation step, the step of heating both said objects while the surfaces of the objects are in contact, thereby covalently bonding both said objects to be bonded together”. **Nagakubo** teaches that bonding both of the objects together via the bonding surfaces results in hydrogen bonding of the objects (Figure 2D). **Nagakubo** further teaches heating the bonded objects to

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<sup>6</sup> Claim 1 specifically includes this feature and Claims 3-5, 7, 12, 16 and 18 are dependent from Claim 1, at least indirectly, and, therefore, also include this feature (emphasis added).

remove water molecules and improve the bond (Column 10, line 63 to Column 11, line 41). Nagakubo teaches heating above 300°C is detrimental to the objects (Column 1, lines 39-49). It would have been obvious to one of ordinary skill in the art at the time the invention was made to perform the heating as taught by Nagakubo at a temperature below 300°C to remove the water molecules without affecting the objects, it being noted removing the water molecules is considered to form Si-O-Si covalent bonds between the objects.<sup>7</sup>

But Allegation 2 cites no portion of Nagakubo that teaches or suggests removing water at temperature of 500°C or less to form Si-O-Si covalent bonds from the hydrogen bonds formed by Nagakubo. Allegation 2 mischaracterizes what Nagakubo fairly teaches regarding removal of water molecules, and especially what type of bonding occurs during such removal.<sup>8</sup> Allegation 2 asserts that, because Nagakubo removes water molecules,<sup>9</sup> “removing the water molecules is considered to form Si-O-Si covalent bonds between the objects.” But what Allegation 2 asserts is not what is described or shown in Nagakubo. Instead, the method of Nagakubo only removes water molecules to form hydrogen bonds, not covalent bonds.<sup>10</sup> The portion of Nagakubo relied upon by Allegation 2<sup>11</sup> does nothing more than remove water to strengthen hydrogen bonds, not covalent bonds. Similarly, the sixth embodiment of Nagakubo, discussed during the Examiner Interview, also only describes removing water to strengthen hydrogen bonds, not covalent bonds.<sup>12</sup>

Contrary to what is asserted in Allegation 2, there is no portion of Nagakubo that teaches or suggests removing water at temperature of 500°C or less to form Si-O-Si covalent bonds from the hydrogen bonds. In fact, Nagakubo specifically describes a prior art process where a temperature of “above 700°C” is required for the dehydration

<sup>7</sup> See present Office Action, pp. 3-4.

<sup>8</sup> The present Office Action, p. 9, makes a similar mischaracterization: “Heating to remove the water molecules as taught by Nagakubo is considered to form Si-O-Si covalent bonds between the objects in the same manner as heating in applicants invention.”

<sup>9</sup> See Nagakubo, column 10, lines 9-17.

<sup>10</sup> See Nagakubo, column 2, line 54 to column 3, line and FIGS. 2A, 2B, 2C and 2D.

<sup>11</sup> See Nagakubo, column 10, lines 9-17: “To the bodies 13 and 14 in this state, radio frequency waves or a direct electric current is applied from a bias power source 50, so that the water molecules are removed from the bonding surfaces of the bodies by an electromagnetic field generated thereby, to form many hydrogen bonds between hydroxide groups and oxygen atoms at the bonding interface and thus obtain a firm bond between the bodies” (emphasis added). That this portion of Nagakubo says that removal of water molecules causes “many hydrogen bonds” to form is clear evidence that what this reference does is remove water molecules without covalent bonding.

<sup>12</sup> See Nagakubo, column 10, line 62 to column 11, lines 5-7.

condensation of hydrogen bonds to occur to form Si-O-Si bonds.<sup>13</sup> Nagakubo also describes the deficiencies of this prior art dehydration-condensation process: "In this model, the bonds between the hydroxide groups, as shown in FIG. 1B, have a very low flexibility and, therefore, bonding between heterogeneous materials is difficult since the distributions of hydroxide groups on the surfaces of the heterogeneous materials are different."<sup>14</sup> Therefore, Nagakubo specifically teaches away from heating the objects to form covalent bonds. The objective of Nagakubo is to avoid the high temperatures and other deficiencies of covalent bonding processes by using a low temperature hydrogen bonding process instead of a high temperature covalent bonding process.

For at least the reasons discussed above, Nagakubo cannot teach or suggest the claimed feature of forming covalent bonds at a temperature of 500°C or less.

#### 5. Additional Differences Between the Claimed Invention and Nagakubo

There are also additional differences between the claimed invention and the process of Nagakubo. For example, the hydrophilic treatment of the present invention is performed using oxygen as a reaction gas in a physical treatment so that OH groups are attached to the surfaces of both said objects to be bonded. This atomically attaches active oxygen ions having dangling bonds to bonding surfaces for the objects to be bonded, and is thus functionally different from etching used in the cleaning step of Nagakubo. In fact, the cleaning by etching using the inert gas as taught by Nagakubo removes impurities from the bonding surfaces,<sup>15</sup> and is thus different from the use of oxygen in the physical treatment step of the amended Claim 1. In the second half of the surface activation step, a chemical treatment with reduced ion strike force to thereby efficiently promote adhesion of the OH groups. This causes active oxygen ions adhere to the bonding surfaces, thereby generating dangling bonds. As a result, activation of the bonding surfaces can be maintained for a relatively long time, thus allowing the physical and chemical treatment of amended Claim 1 to be performed even in a low vacuum. By contrast, the dangling

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<sup>13</sup> See Nagakubo, column 2, lines 37-45.

<sup>14</sup> See Nagakubo, column 2, lines 47-53.

<sup>15</sup> See Nagakubo, column 2, lines 54-58.

bonds of **Nagakubo** are generated by etching bonding surfaces using an inert gas such as argon (Ar), so that the activated state of the bonding surfaces cannot be maintained for as long a time.<sup>16</sup>

6. **Claims 1, 3-5, 7, 12, 16 and 18 are Patentable over Nagakubo**

For at least the above reasons, Claims 1, 3-5, 7, 12, 16 and 18 are patentable over **Nagakubo**, taken alone.

7. **The Combination of Katada with Nagakubo Cannot Teach or Suggest the Claimed Invention**

In rejecting Claims 1, 3-5, 7, 12 and 16-18 over **Nagakubo**, in view of **Goel**, and optionally **Katada**, and/or **Xu** or **Vasudev**, the present Office Action also relies upon following allegation:

***Allegation 3:*** This limitation is also optionally rejected in view of **Katada**. As noted above, **Nagakubo** teaches that bonding both of the objects together via the bonding surfaces result in hydrogen bonding of the objects. It was known in the art of bonding objects substantially the same as that taught by **Nagakubo**, i.e. subjecting bonding surfaces of the objects to a hydrophilic plasma treatment step using a reaction gas containing oxygen so that OH groups are attached to the bonding surfaces of both of the objects and bonding both of the objects together via the bonding surfaces resulting in hydrogen bonding of the objects, to subsequently heat the objects at a temperature less than 500°C such as 200°C to remove any water molecules and replace the hydrogen bonds with covalent Si-O-Si bonds and thereby increase the bonding strength by heating to a temperature lower than that which was conventionally used in the art as shown by **Katada** (Figure 1 and Column 2, lines 25-30 and 63-68 and Column 4, lines 3-58 and Column 5, lines 17-30). It would have been obvious to one of ordinary skill in the art at the time the invention was made to include in **Nagakubo** a step of heating the bonded objects at a temperature less than 500°C to remove any water molecules and replace the hydrogen bonds with covalent Si-O-Si bonds thereby increasing the bonding strengthening to a temperature lower than that know[n] to negatively affect the objects.<sup>17</sup>

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<sup>16</sup> See **Nagakubo**, column 7, lines 54-61.

<sup>17</sup> See present Office Action, pp. 4-5.

But Allegation 3 mischaracterizes the process described in **Katada**. **Katada** does not merely heat the semiconductor substrates to form Si-O-Si bonds. Instead, **Katada requires that water be added to the surfaces of oxidized semiconductor substrates which are then contacted and heated to form Si-O-Si bonds.**<sup>18</sup> Without the **addition of water** to the oxidized surfaces of the semiconductor substrates, **Katada** states that a temperature of more than **800°C** is required for the dehydration-condensation of hydrogen bonds to occur **to form Si-O-Si bonds.**<sup>19</sup> In addition, unlike **Katada**, the claimed invention does not require the addition of water prior to heating to form Si-O-Si bonds and forms hydrogen bonds between substrate surfaces by the interaction of OH groups on the surfaces, and not by the addition of water between two oxidized surfaces. For at least the above reasons, the combination of **Katada** with **Nagakubo** cannot teach or suggest the claimed invention.

#### 8. **No Proper Grounds for Combining Katada with Nagakubo Are Alleged**

Furthermore, the present Office Action has failed to provide any proper grounds for combining **Katada** with **Nagakubo**.<sup>20</sup> In alleging that **Katada** can be combined with **Nagakubo**, the present Office Action implies that a person of ordinary skill in the art would be motivated to combine the following method steps in the following order: 1. Removing water to form hydrogen bonds between OH groups on two surfaces as described and shown by **Nagakubo**<sup>21</sup> followed by 2. Adding water to the surfaces of semiconductor substrates having an oxide layer to form hydrogen bonds as described and shown by **Katada**.<sup>22</sup> As can be seen in steps 1 and 2 above, **Nagakubo** and **Katada** teach away from each. Therefore, in rejecting Claims 1, 3-5, 7, 12, 16 and 18 over the combination of **Katada** with **Nagakubo**, the present Office Action has failed to consider that the proposed modification of **Nagakubo** by **Katada** would change the principle of operation of the method of **Nagakubo**. Therefore, the

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<sup>18</sup> See **Katada**, column 2, lines 36-50.

<sup>19</sup> See **Katada**, column 1, lines 32-35.

<sup>20</sup> See *In re Fine*, 5 USPQ2d 1596, 1599 (Fed. Cir. 1988); *In re Kahn*, 78 U.S.P.Q.2d 1329, 1336 (Fed. Cir. 2006).

<sup>21</sup> See **Nagakubo**, column 10, lines 9-17: "To the bodies 13 and 14 in this state, radio frequency waves or a direct electric current is applied from a bias power source 50, so that the water molecules are removed from the bonding surfaces of the bodies by an electromagnetic field generated thereby, to form many hydrogen bonds between hydroxide groups and oxygen atoms at the bonding interface and thus obtain a firm bond between the bodies" and FIGS. 2B, 2C and 2D (emphasis added).

<sup>22</sup> See **Katada**, column 2, lines 51-59.



combination of **Katada** with **Nagakubo** is improper, because the proposed combination of the **Katada** with **Nagakubo** would improperly change the principle of operation of Nagakubo.<sup>23</sup>

9. **Claims 1, 3-5, 7, 12, 16 and 18 Patentable over the Combination of Katada with Nagakubo**

For at least the above reasons Claims 1, 3-5, 7, 12, 16 and 18 are patentable over the combination of **Katada** with **Nagakubo**.

10. **Goel Cannot Remedy Deficiencies of the Combination of Katada with Nagakubo**

**Goel** is only cited by the present Office Action for showing that “It was known in argon ion etching to include oxygen gas to improve the efficiency and adhesive properties.”<sup>24</sup> Therefore, **Goel** cannot remedy the deficiencies of the rejection of Claims 1, 3-5, 7, 12, 16 and 18 over the combination of **Katada** with **Nagakubo** discussed above in Sections E(2), E(3), E(4), E(7) and E(8).

11. **Claims 1, 3-5, 7, 12, 16 and 18 are Patentable over the Combination of Goel and Katada with Nagakubo**

Also, the reliance on **Goel** in rejecting Claims 1, 3-5, 7, 12, 16 and 18 is misplaced. As Applicant pointed out in Applicant’s prior response of November 4, 2008,<sup>25</sup> **Goel** is not directed at processes for bonding objects according to **Nagakubo**, much less the method of the claimed invention. Instead, as shown by the cited portion of **Goel** relied upon by the present Office Action,<sup>26</sup> **Goel** is directed at improving the adhesion of a **diamond-like carbon containing**

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<sup>23</sup> See, e.g., *In re Ratti*, 270 F.2d 810, 123 USPQ 349 (CCPA 1959); MPEP § 2143.01(VI).

<sup>24</sup> See present Office Action, p. 5.

<sup>25</sup> See pages 18-19 of Amendment After Final filed October 1, 2008 entered pursuant to Applicant’s Request for Continued Examination (RCE) November 2, 2008

<sup>26</sup> See present Office Action, p. 5 which cites **Goel**, column 6, lines 59-65: “In addition to argon ion etching, other plasma cleaning can be performed by the introduction of small amounts of oxygen gas in addition to the argon gas.

material to a substrate. By contrast, the claimed invention uses “oxygen gas as a reaction gas in said physical treatment step so that OH groups are attached to the surfaces of both said objects to be bonded”. Therefore, Goel uses oxygen gas for an entirely different purpose than in the claimed invention.

**12. No Proper Motivation to Combine Goel with Nagakubo**

There are additional problems with the present Office Action’s proposed combination of **Goel** with **Nagakubo**. For example, **Goel** is not directed at processes for bonding objects according to **Nagakubo**. Because of the different purposes of **Goel** and **Nagakubo**, it would be sheer coincidence for one of ordinary skill in the art to consider the teachings of **Goel** relevant to the bonding process of **Nagakubo**, much less be “motivated” to combine the teachings of **Goel** with those of **Nagakubo** according to the instant Claims. Again, as with the combination of **Katada** with **Nagakubo**, the present Office Action provides no proper basis for combining **Goel** with **Nagakubo**.

In fact, because the present Office Action fails to provide a proper “motivation” for combining the teachings of **Goel** with **Nagakubo**, it appears that the present Office Action has rejected Claims 1, 3-5, 7, 12, 16 and 18, at least partially, on facts within the personal knowledge of the Examiner that have not been provided to the Applicant. Accordingly, if the Examiner wishes to persist in this rejection under U.S.C. § 103(a) of Claims 1, 3-5, 7, 12, 16 and 18, Applicant respectfully requests that he provide an affidavit/declaration under 37 CFR § 1.104(d)(2)<sup>27</sup> the rejection of Claims 14 and 15 appears to be based, at least partially, on facts

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This process has been found to efficiently remove hydrocarbon contamination, oxide layers, and other contaminants, as well as improving the adhesion of coatings deposited on some substrates.”

<sup>27</sup> See 37 CFR § 1.104(d)(2) which states: “When a rejection in an application is based on facts within the personal knowledge of an employee of the Office, the data shall be as specific as possible, and the reference must be supported, when called for by the applicant, by the affidavit of such employee, and such affidavit shall be subject to contradiction or explanation by the affidavits of the applicant and other persons.” Applicant again notes that in the unpublished case of *In re Sun*, 31 USPQ2d 1451, 1455 (Fed. Cir. 1993), the USPTO argued “the procedures established by 37 C.F.R. Section 1.107(b) (1993) [now 37 CFR § 1.104(d)(2)] *expressly entitle* an Applicant, on mere request, to an examiner affidavit that provides [citations that support the Examiner’s asserted level of skill in the art]” (emphasis added). Furthermore, in *In re Sun*, the Federal Circuit, held that “this procedure, so readily available, helps save the lack of citation in an office action from possible constitutional infirmity in denying reasonable notice and hence due process.” See 31 USPQ2d at 1455.

within the Examiner's personal knowledge that have not been provided to the Applicant, and which are not fairly taught or suggested by **Goel** and **Nagakubo**.

**13. Claims 1, 3-5, 7, 12, 16 and 18 are Patentable over the Combination of Goel and Katada with Nagakubo**

For at least the above reasons, Claims 1, 3-5, 7, 12, 16 and 18 are patentable over the combination of **Goel** and **Katada** with **Nagakubo**.

**14. Claims 1, 3-5, 7, 12, 16 and 18 are Patentable over the Combination of Xu, Vasudev, Goel and Katada with Nagakubo**

**Xu** and **Vasudev** are only cited by the present Office Action for showing that "It was known in argon ion etching/sputter etching with ionized argon [to be] performed using a plasma treatment as a source".<sup>28</sup> Therefore, **Xu** and **Vasudev** cannot remedy the deficiencies of the rejection of Claims 1, 3-5, 7, 12, 16 and 18 over the combination of **Katada** with **Nagakubo** discussed above in Sections E(2), E(3), E(4), E(7) and E(8) and the deficiencies of the rejection of these claims over the combination of **Goel** and **Katada** with **Nagakubo** discussed above in Section E(10).

In addition, the reliance in the present Office Action on **Xu**, or **Vasudev** in rejecting Claims 1, 3-5, 7, 12, 16 and 18 is misplaced. The present Office Action simply makes the conclusory statement that it "is well known in the art that ion etching/sputter etching with ionized argon is performed using a plasma treatment source as shown by **Xu** (Column 3, lines 1-2) or **Vasudev** (Column 4, lines 53-54)."<sup>29</sup> But the cited portion of **Xu** relied upon by the present Office Action<sup>30</sup> simply teaches that a plasma treatment source may include sputter/ion etching, not that sputter/ion etching in the method of **Nagakubo** must necessarily be carried out as a plasma treatment. Also, the cited portion **Vasudev** relied upon by the present Office

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<sup>28</sup> See present Office Action, p. 5.

<sup>29</sup> See present Office Action, p. 5.

<sup>30</sup> See **Xu**, column 3, lines 1-2: "among a variety of plasma treatment sources, such as sputter/ion etching, hydrogen, nitrogen, oxygen, argon, etc., plasma sources for performing simultaneous treatment of"

Action<sup>31</sup> simply teaches that etching techniques may include sputter etch in argon plasma, not that sputter/ion etching in the method of **Nagakubo** must necessarily be carried out as a plasma treatment. Accordingly, because **Nagakubo** does not characterize sputter/ion etching as a “plasma treatment,” the present Office Action provides no properly alleged basis or “motivation” for combining the teachings of **Xu** or **Vasudev** with those of **Nagakubo**.

In fact, because the Office Action fails to provide a proper “motivation” for combining the teachings of **Xu**, or **Vasudev** with **Nagakubo**, it appears that the present Office Action has rejected Claims 1, 3-5, 7, 12, 16 and 18, at least partially, on facts within the personal knowledge of the Examiner that have not been provided to the Applicant. Accordingly, if the Examiner wishes to persist in this rejection under U.S.C. § 103(a) of Claims 1, 3-5, 7, 12, 16 and 18, Applicant respectfully requests that he provide an affidavit/declaration under 37 CFR § 1.104(d)(2)<sup>32</sup> the rejection of Claims 1, 3-5, 7, 12, 16 and 18 appears to be based, at least partially, on facts within the Examiner’s personal knowledge that have not been provided to the Applicant, and which are not fairly taught or suggested by **Xu**, **Vasudev**, and/or **Nagakubo**.

For at least the above reasons, Claims 1, 3-5, 7, 12, 16 and 18 are patentable over the combination of **Xu**, **Vasudev**, **Goel** and **Katada** with **Nagakubo**.

**F. Response to Rejection of Claims 14 and 15 under 35 U.S.C. § 103(a) as being Unpatentable over Nagakubo, and Goel, and Optionally Katada, and/or Xu or Vasudev, and Further in View of Kobayashi**

At Section 6 of the present Office Action, Claims 14 and 15 are rejected under 35 U.S.C. § 103(a) as being unpatentable over **Nagakubo**, in view of **Goel**, and optionally **Katada**, and/or **Xu**, or **Vasudev**, and further in view of U.S. Pat. No. 6,512,562 to Kobayashi *et al.* (hereinafter

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<sup>31</sup>See **Vasudev**, column 4, lines 53-54: “Finally, a subsequent etching technique, such as a sputter etch in argon (Ar.sup.+) plasma”

<sup>32</sup> See 37 CFR § 1.104(d)(2) which states: “When a rejection in an application is based on facts within the personal knowledge of an employee of the Office, the data shall be as specific as possible, and the reference must be supported, when called for by the applicant, by the affidavit of such employee, and such affidavit shall be subject to contradiction or explanation by the affidavits of the applicant and other persons.” Applicant again notes that in the unpublished case of *In re Sun*, 31 USPQ2d 1451, 1455 (Fed. Cir. 1993), the USPTO argued “the procedures established by 37 C.F.R. Section 1.107(b) (1993) [now 37 CFR § 1.104(d)(2)] *expressly entitle* an Applicant, on mere request, to an examiner affidavit that provides [citations that support the Examiner’s asserted level of skill in the art]” (emphasis added). Furthermore, in *In re Sun*, the Federal Circuit, held that “this procedure, so readily available, helps save the lack of citation in an office action from possible constitutional infirmity in denying reasonable notice and hence due process.” See 31 USPQ2d at 1455.

“**Kobayashi**”).<sup>33</sup> This rejection is respectfully traversed with respect to these claims as currently presented, for at least the following reasons.

Claims 14 and 15 are dependent from amended Claim 1. Amended Claim 1 is patentable over the combination of **Xu, Vasudev, Goel** and **Katada** with **Nagakubo** for at least the reasons discussed above in Section E. **Kobayashi** is only cited by the present Office Action for showing that “It was known to include nitrogen gas, oxygen gas, hydrogen gas, etc. to improve the adhesive properties”.<sup>34</sup> Accordingly, **Kobayashi** cannot remedy the deficiencies of the rejection of Claims 1, 3-5, 7, 12, 16 and 18 over the combination of **Xu, Vasudev, Goel** and **Katada** with **Nagakubo** discussed above in Section E. Therefore, amended Claim 1 is patentable over the combination of **Kobayashi, Xu, Vasudev, Goel** and **Katada** with **Nagakubo** for at least this reason. Because Claims 14 and 15 are dependent from amended Claim 1, Claims 14 and 15 are also patentable over the combination of **Kobayashi, Xu, Vasudev, Goel** and **Katada** with **Nagakubo** for at least the same reasons that amended Claim 1 is patentable over this combination.

In addition, the present Office Action does not properly support the rejection of Claims 14 and 15 for an additional reason, namely the present Office Action provides no properly alleged basis for combining the teachings of **Goel**, and/or **Kobayashi** with those of **Xu**, or **Vasudev**, and/or **Nagakubo** with respect to Claims 14 and 15. The present Office simply makes the conclusory statement that it would be obvious “to include oxygen gas in the physical treatment step and nitrogen gas in the chemical treatment step taught by **Nagakubo** (or **Nagakubo** as modified by **Xu** or **Vasudev**)” to improve “the efficiency of the step and adhesive properties as shown by **Goel** and **Kobayashi**.”<sup>35</sup> But neither **Goel**, nor **Kobayashi** are directed at processes for bonding objects according to **Nagakubo**, much less according to the method of Claims 14 and 15.

Instead, as shown by the cited portion of **Goel** relied upon by the present Office Action,<sup>36</sup> **Goel** is directed at improving the adhesion of a **diamond-like carbon containing material to a**

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<sup>33</sup> See present Office Action, pp. 7-8.

<sup>34</sup> See present Office Action, p. 7.

<sup>35</sup> See present Office Action, pp. 7-8.

<sup>36</sup> See present Office Action, p. 5 which cites **Goel**, column 6, lines 59-65: “In addition to argon ion etching, other plasma cleaning can be performed by the introduction of small amounts of oxygen gas in addition to the argon gas. This process has been found to efficiently remove hydrocarbon contamination, oxide layers, and other contaminants, as well as improving the adhesion of coatings deposited on some substrates.”

substrate. As shown by the cited portion of **Kobayashi** relied upon by the present Office Action,<sup>37</sup> **Kobayashi** is directed at improving the adhesion of a protective film to a polarizing plate. It would be sheer coincidence for one of ordinary skill in the art to consider the teachings of **Goel** and/or **Kobayashi** relevant to the bonding process of **Nagakubo**, much less be “motivated” to combine the teachings of **Goel** and/or **Kobayashi** with those of **Nagakubo** according to the method of Claims 14 and 15. In sum, the present Office Action provides no properly alleged basis or “motivation” for combining the teachings of **Goel** and/or **Kobayashi** with those of **Xu**, or **Vasudev**, and/or **Nagakubo** with respect to Claims 14 and 15.

In fact, because the present Office Action fails to provide a proper “motivation” for combining the teachings of **Goel** and/or **Kobayashi** those of **Xu**, or **Vasudev**, and/or **Nagakubo** with respect to Claims 14 and 15, it appears that the present Office Action has rejected Claims 14 and 15, at least partially, on facts within the personal knowledge of the Examiner that have not been provided to the Applicant. Accordingly, if the Examiner wishes to persist in this rejection under U.S.C. § 103(a) of Claims 14 and 15, Applicant respectfully requests that he provide an affidavit/declaration under 37 CFR § 1.104(d)(2)<sup>38</sup> the rejection of Claims 14 and 15 appears to be based, at least partially, on facts within the Examiner’s personal knowledge that have not been provided to the Applicant, and which are not fairly taught or suggested by **Goel**, **Kobayashi**, **Xu**, **Vasudev**, and/or **Nagakubo**.

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<sup>37</sup>See present Office Action, p. 7 which cites **Kobayashi**, column 8, lines 20-24: “After carrying out the plasma treatment under conditions in which the C-C bond or C-H bond of organic substances on the film surface is broken, the plasma treatment is preferably carried out under conditions in which hydroxyl groups or amino groups are formed on the film surface. By so doing, it is possible to introduce more hydroxyl groups or amino groups and to obtain the film which exhibits better adhesive properties. Specifically, the plasma treatment is preferably carried out in the presence of at least two types of gases selected from inert gases, such as argon, neon, and the like, hydrogen, oxygen, ozone, water vapor, carbon dioxide, carbon monoxide, nitrogen, ammonia, nitrogen monoxide, nitrogen dioxide, lower hydrocarbons such as methane, ethane, and the like, low boiling point organic compounds such as ketone, alcohol, and the like.”

<sup>38</sup> See 37 CFR § 1.104(d)(2) which states: “When a rejection in an application is based on facts within the personal knowledge of an employee of the Office, the data shall be as specific as possible, and the reference must be supported, when called for by the applicant, by the affidavit of such employee, and such affidavit shall be subject to contradiction or explanation by the affidavits of the applicant and other persons.” Applicant again notes that in the unpublished case of *In re Sum*, 31 USPQ2d 1451, 1455 (Fed. Cir. 1993), the USPTO argued “the procedures established by 37 C.F.R. Section 1.107(b) (1993) [now 37 CFR § 1.104(d)(2)] expressly entitle an Applicant, on mere request, to an examiner affidavit that provides [citations that support the Examiner’s asserted level of skill in the art]” (emphasis added). Furthermore, in *In re Sum*, the Federal Circuit, held that “this procedure, so readily available, helps save the lack of citation in an office action from possible constitutional infirmity in denying reasonable notice and hence due process.” See 31 USPQ2d at 1455.

For at least the above reasons, Claims 14 and 15, as currently presented, are patentable over **Nagakubo** (or **Nagakubo** and **Xu** or **Vasudev**), even further in view of **Goel** and **Kobayashi**.

**G. Comments on Examiner's Response to Applicant's Arguments**

The allegation at Section 7 of the present Office Action that "Nagakubo specially teach heating the objects as described"<sup>39</sup> is rebutted in the above discussion of the deficiencies of **Nagakubo** in Section E.

The allegation at Section 7 of the present Office Action that "Heating to remove the water molecules is considered to form Si-O-Si covalent bonds between objects in the same manner as heating in applicants invention. Further this limitation is optionally rejected in view of **Katada**"<sup>40</sup> is rebutted in the above discussion of the deficiencies of **Nagakubo** and in the above discussion in Section E of the deficiencies of the combination of **Katada** with **Nagakubo**.

The allegation at Section 7 of the present Office Action that "The physical plasma treatment performed using oxygen taught by Nagakubo as modified by Goel attaches active oxygen ions in the same manner as the plasma treatment performed using oxygen in applicants specification or the plasma treatment performed using oxygen shown by **Katada**"<sup>41</sup> is rebutted in the above discussion in Section E of the deficiencies of combination of **Goel** and **Katada** with **Nagakubo**.

The allegation at Section 7 of the present Office Action that "Nagakubo teaches a chemical treatment step with reduced ion strike force which causes adhesion of OH groups to the bonding surfaces"<sup>42</sup> is rebutted in the above discussion in Section E of the deficiencies of **Nagakubo**.

The allegation at Section 7 of the present Office Action that "As to applicants arguments in allegations 1-3 of failure to provide proper "motivation" it is noted in each rejection above an obviousness statement including proper motivation for combining each reference is fully set

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<sup>39</sup> See present Office Action, p. 8.

<sup>40</sup> See present Office Action, p. 9.

<sup>41</sup> See present Office Action, p. 9.

<sup>42</sup> See present Office Action, p. 9.

forth<sup>43</sup> is rebutted in the above discussion in Sections E and F of the failure of the present Office Action to proper motivation to combine the cited references.

#### **H. Conclusion**

Claims 1, 3-5, 7, 12, 16 and 18, as amended or as currently presented, are unobvious over the art relied on in the Final Action. Accordingly, 1, 3-5, 7, 12, 16 and 18, as amended or as currently presented, are in condition for allowance and favorable action is earnest solicited thereon.

Should the Examiner feel that there are any issues outstanding after consideration of this response, the Examiner is invited to contact the undersigned to expedite prosecution of the application.

The Commissioner is hereby authorized by this paper to charge any fees during the entire pendency of this application including fees due under 37 C.F.R. §§ 1.16 and 1.17 which may be required, including any required extension of time fees, or credit any overpayment to Deposit Account 10-0233. **This paragraph is intended to be a CONSTRUCTIVE PETITION FOR EXTENSION OF TIME in accordance with 37 C.F.R. § 1.136(a)(3).**

Respectfully submitted,

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<sup>43</sup> See present Office Action, p. 9.